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# LHEES Capacity Building Workshop

QGIS demonstrations

Fri 28th April 2023

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# Welcome and Introduction

## Aims of the LHEES capacity building workshop

- Understand the adaptability of methodologies to other GIS software
- Provide uniform steps from the Stage 4 methodologies between ArcGIS and QGIS so that they can be replicated
- Provide an opportunity for local authority Q&A / feedback

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# LHEES Capacity Building Workshop

## QGIS Demonstrations



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# *Summary of LHEES Stages and Considerations*

- LHEES Considerations
- LHEES Structure and Stages

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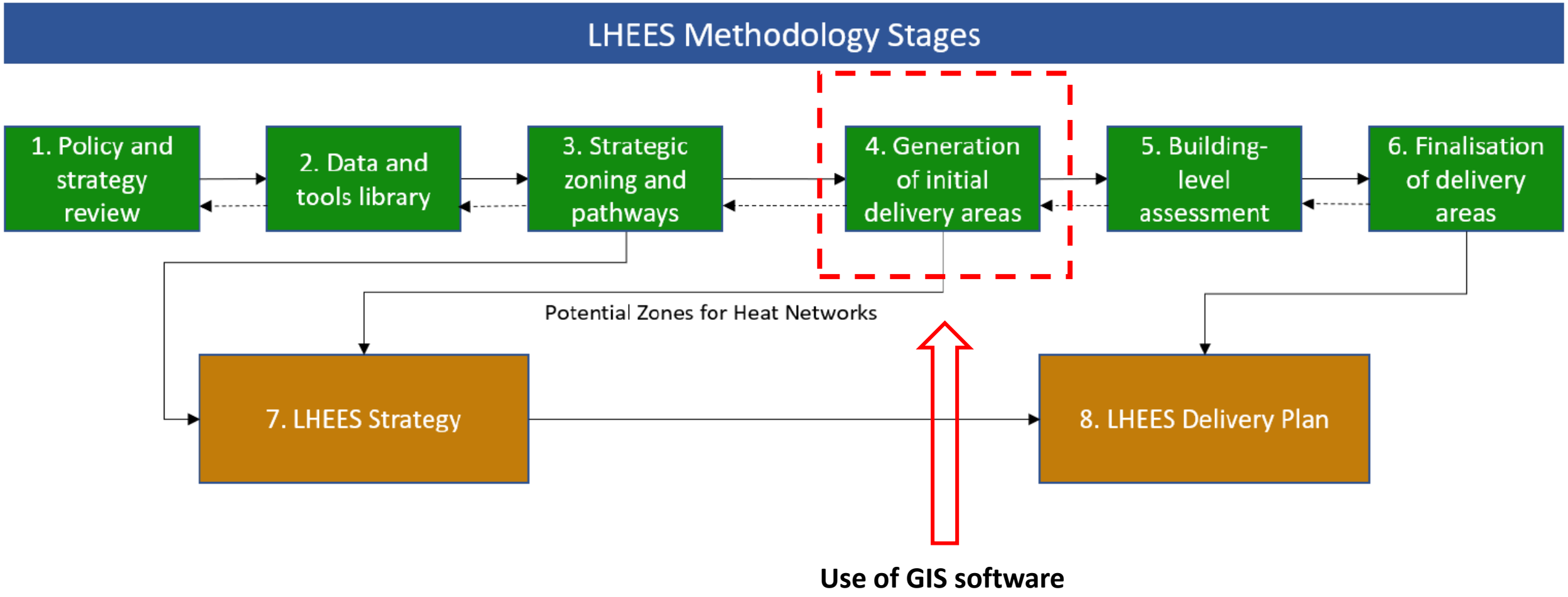
# LHEES Considerations

| | No. | LHEES considerations | Description |
|---|---|---|---|
| Heat decarbonisation | 1 | Off-gas grid buildings | Transitioning from heating oil and LPG in off-gas areas |
| | 2 | On-gas grid buildings | On-gas grid heat decarbonisation |
| | 3 | Heat networks | Decarbonisation with heat networks |
| Energy efficiency and other outcomes | 4 | Poor building energy efficiency | Poor building energy efficiency |
| | 5 | Poor building energy efficiency as a driver for fuel poverty | Poor building energy efficiency as a driver for fuel poverty |
| | 6 | Mixed-tenure, mixed-use and historic buildings | Mixed-tenure, mixed-use buildings, listed buildings, and buildings in conservation areas |

# LHEES Structure and Stages



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# *QGIS Introduction*

- Why QGIS?
- Data Types
- Breakdown of QGIS approaches

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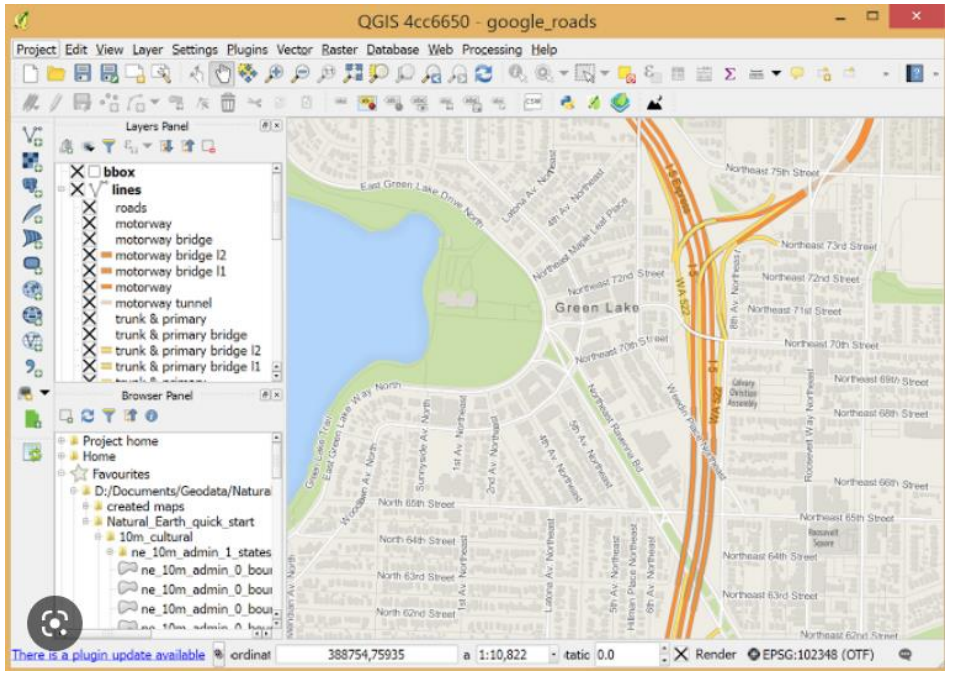
# QGIS - Introduction

- QGIS is a ***free*** and open-source cross-platform geographic information system (GIS) software that supports viewing, editing, printing, and analysis of geospatial data.
- Historically most local authorities have used ArcGIS for spatial analysis of data.
- However, some local authorities use QGIS.
- LHEES ***Stage 4 methodologies*** were generated for use with ArcGIS this presentation shows the equivalent steps using QGIS.
- Need for the methodologies to be streamlined so they can be followed using both software packages.



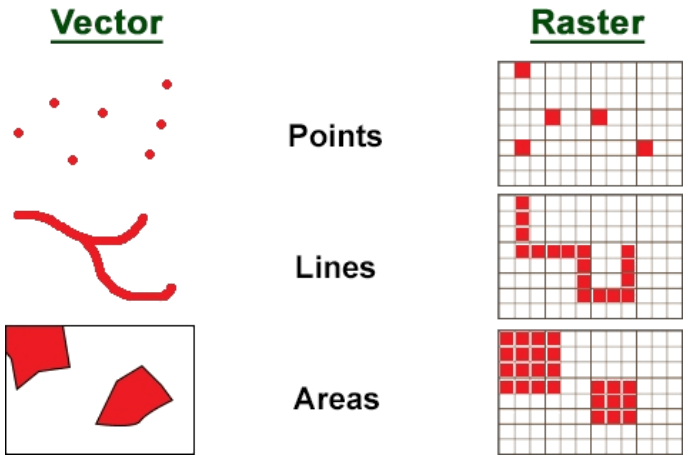
# GIS basics - Introduction

## Vector Data

- Vector data is a geographic data type where data is stored as a collection of **points**, **lines**, or **polygons** along with **attribute data**.

## Raster Data

- Raster data is a geographic data type where data is stored as a grid of regularly sized **pixels** along with attribute data.



# QGIS - Introduction

The LHEES Stage 4 approaches utilising ArcMap have been categorized into 7 QGIS groups.

1. QGIS Set-Up
2. Importing of Layers
3. Attribute Table Related
4. Selection
5. Vector Processes
6. Raster Processes
7. Symbology

Steps will be walked through using various LHEES Priorities for the area of **Central St Andrews in Fife**.

# How are we going to run the presentation

**Slide Setup**:

- Listing of where each task is applicable in each LHEES methodology.
- Undertake few Sections then QGIS walkthrough
- Five Demos between seven QGIS Sections

Where is this applicable:

- All Stage 4 Methodologies

Where is this applicable:

- Non-Domestic – (1, 2)
- Heat Networks – (1, 2)
- Off Gas Grid – (1)
- Energy Efficiency – (2)
- Mixed Tenure – N/A
- On Gas Grid – (1)

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# *QGIS Set-Up*

- Coordinate System
- Add a Basemap

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# QGIS – Set-Up

**Set-Up Introduction:**

- Steps for opening the QGIS workspace for Stage 4 analysis
- Includes workspace setup (e.g. basemaps, applying projections) allows uniformity in the GIS analysis and outputs

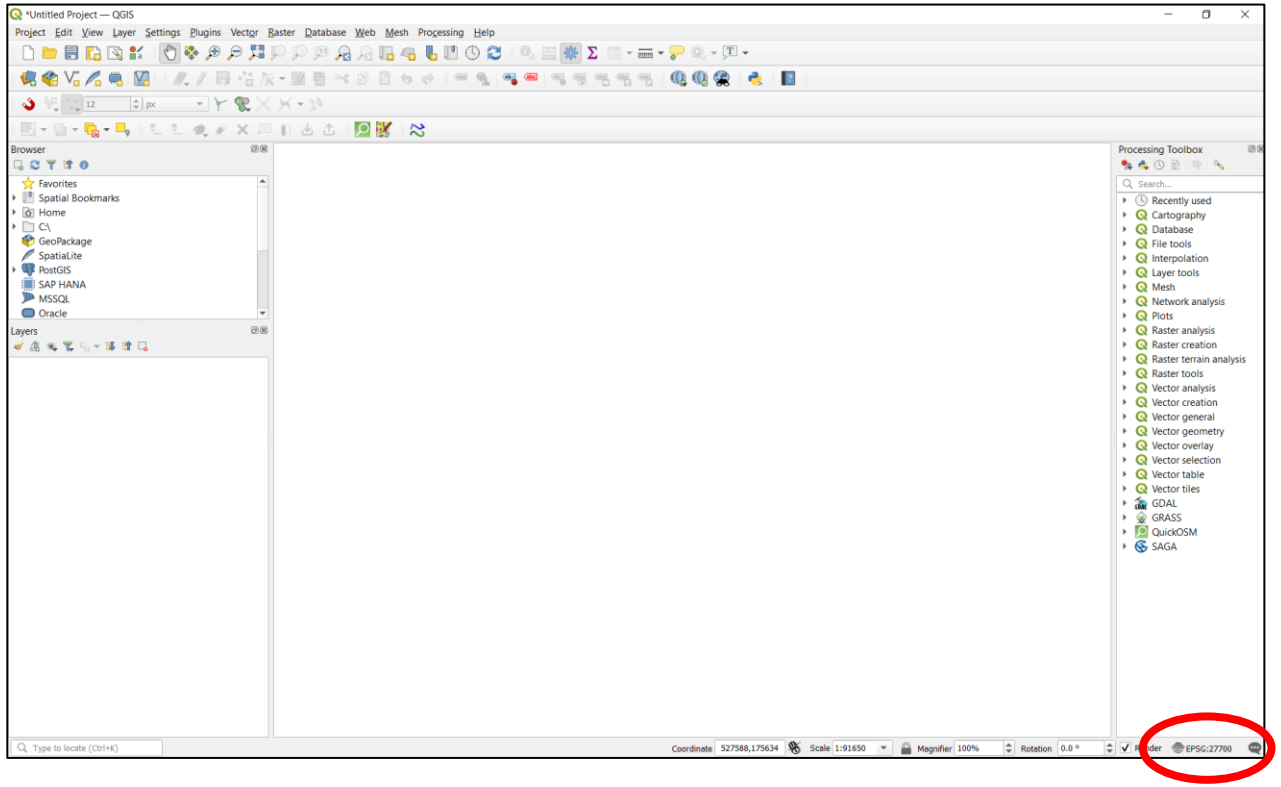
# QGIS - Set Up

Where is this applicable:

- All Stage 4 Methodologies

## Coordinate System:

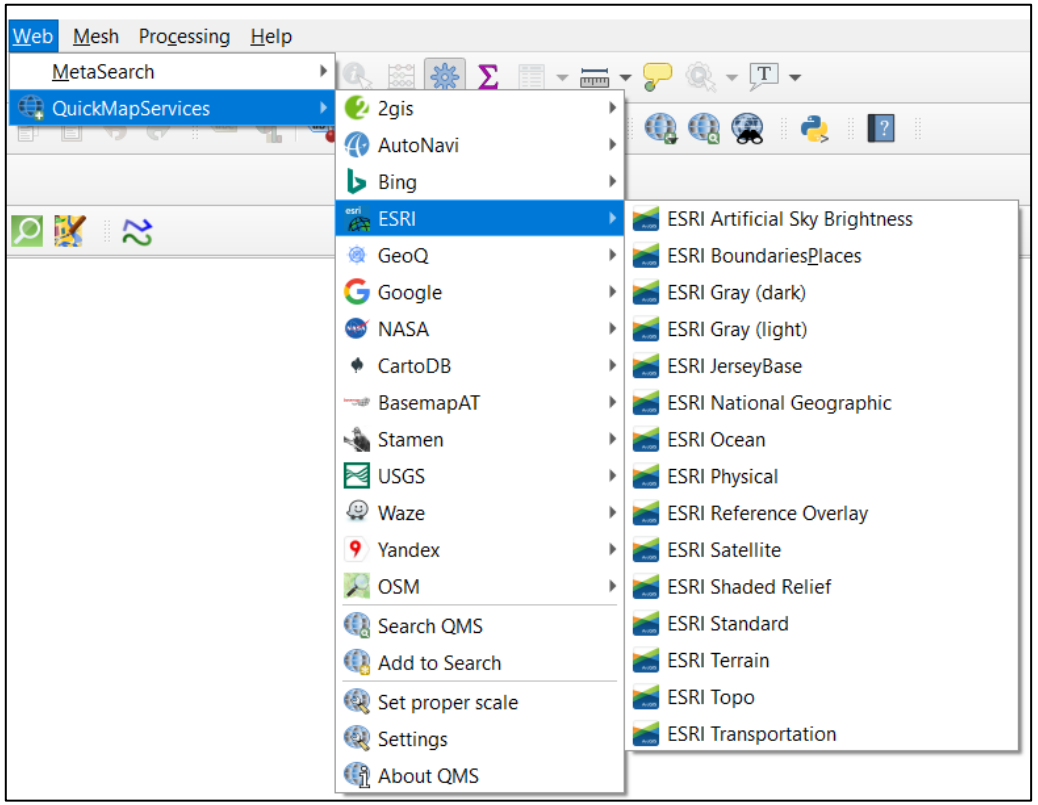
- Open Workspace
- Navigate to “Project Properties – CRS”
- Select “**EPSG:27700 – British National Grid**”
- Coordinate System is presented in bottom right-hand corner




## Basemap:

- Various basemaps available for utilisation
- As per Stage 4 methodologies, select “**ESRI Topo**”

Installation of the “QuickMapServices” Plugin may be required to get range of basemaps available.



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# *QGIS Importing of Layers*

- Import Vector Files
- Import Raster Files
- Import a CSV Files
- Create Geodatabase
- Save Files in a Geodatabase

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# QGIS – Importing of Layers

**Importing of Layers Introduction:**

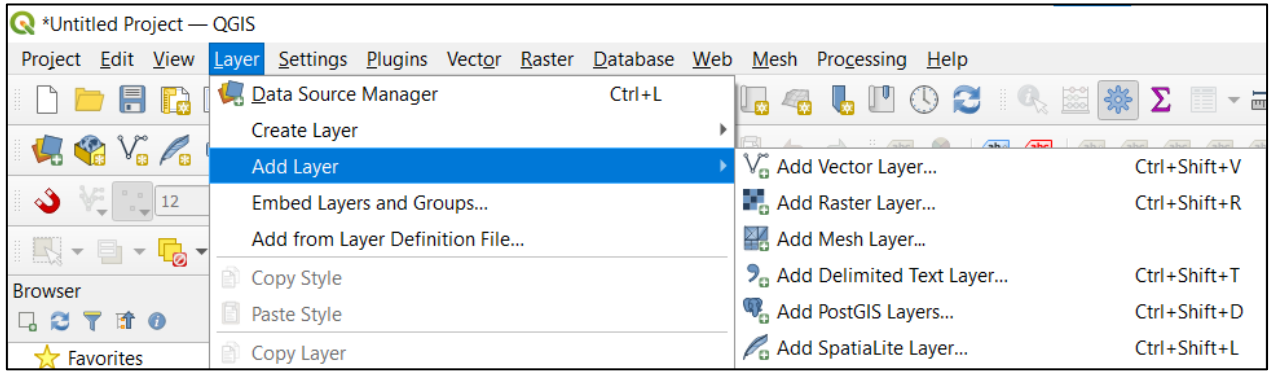
- Steps for inputting different data types into a QGIS workspace
- Saving layers within a single, central database for each Stage 4 Methodology.
- Geopackages improve organization of multiple layers and distribution of files.

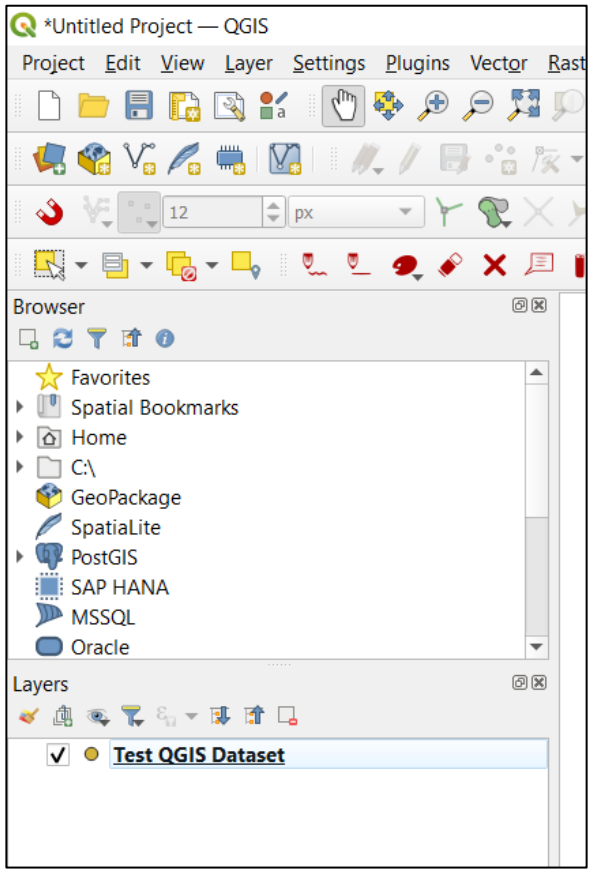
# QGIS – Importing of Layers

Where is this applicable:
- All Stage 4 Methodologies

**Import Vector and Raster Files:**

- Navigate to Layer -> Add Layer
- Select either Add Vector or Raster Layer
- Click "…" to select File and OK to import into workspace
- Imported Files are shown in **Layer Window**
- Slightly different for .csv files



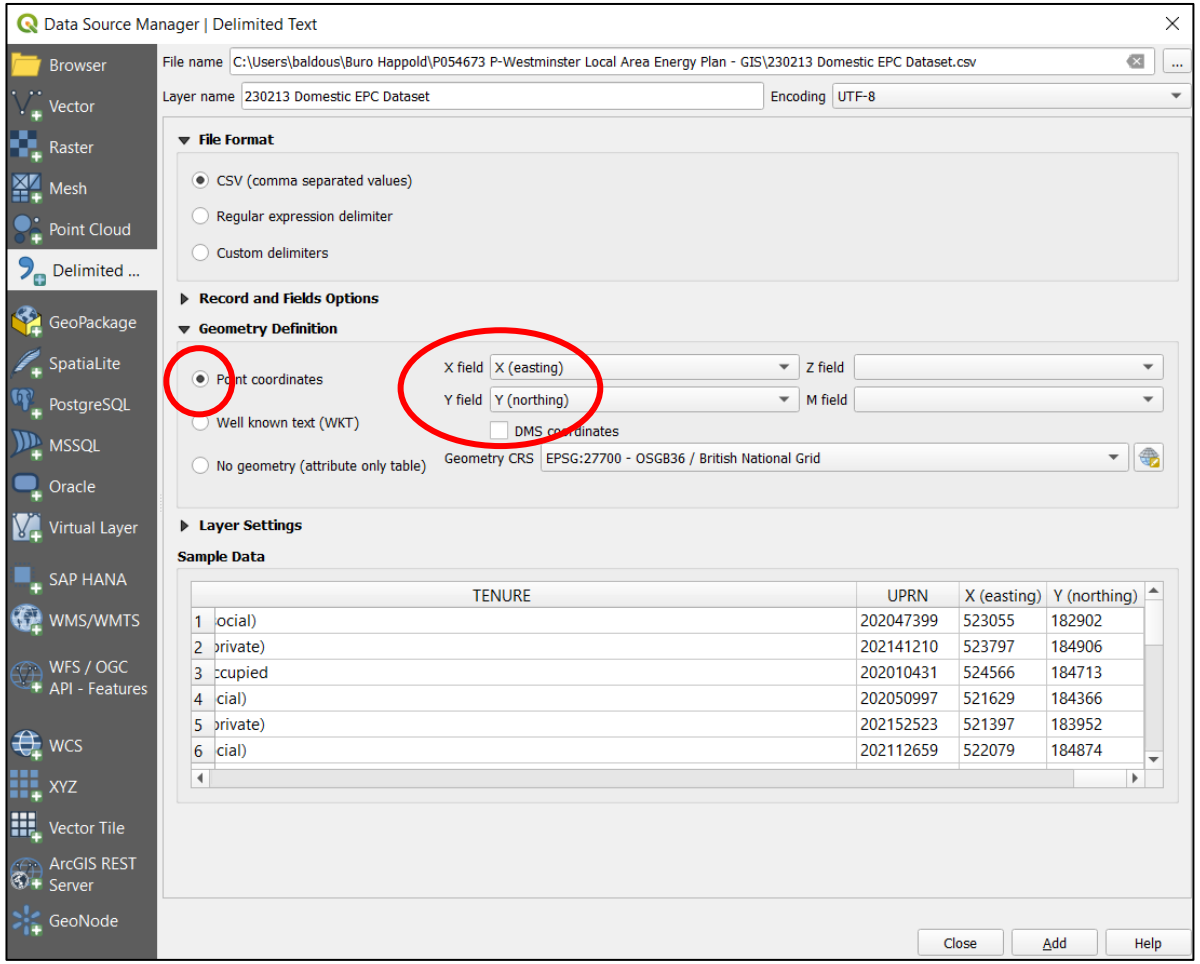

# QGIS – Importing of Layers

Where is this applicable:

- All Stage 4 Methodologies

**Import CSV Files:**

- Navigate to Layer -> Add Layer
- Select "**Delimited Text Layer**"
- Click "…" to select File
- Ensure to:
  - File Format = "**CSV**"
  - Geometry Definition = "**Point Coordinates**"
  - The X and Y Fields correspond to those in the CSV
- Attribute Table Visualised
- Add Dataset

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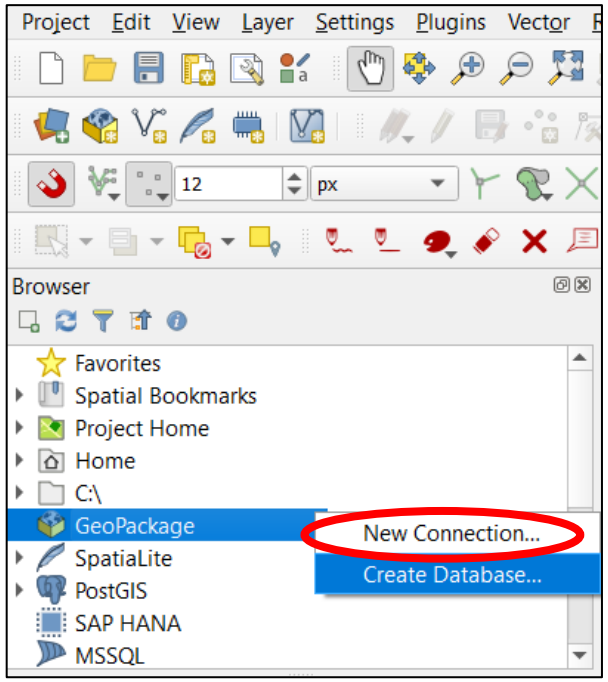
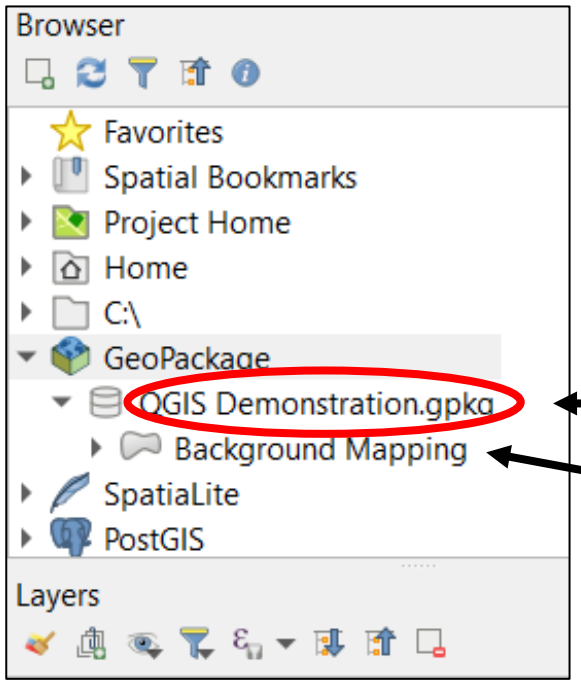
# QGIS – Importing of Layers

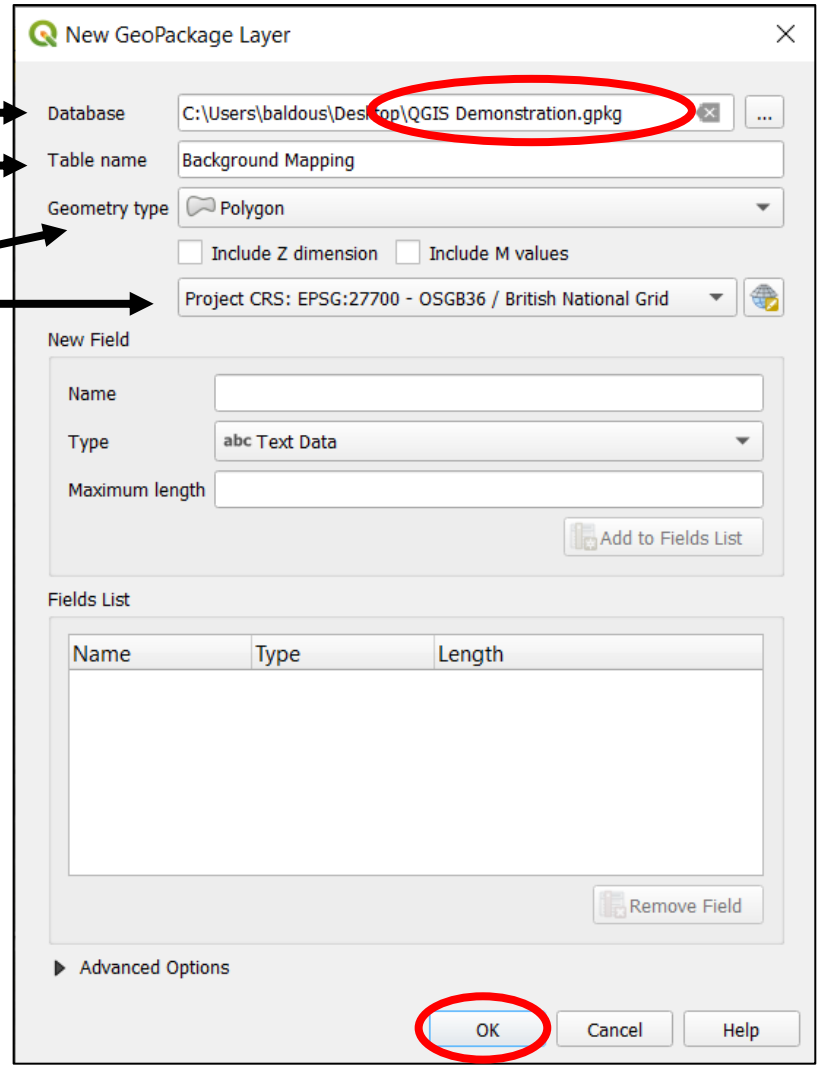
**Where is this applicable:**
- All Stage 4 Methodologies

## Geodatabase:

- Creation of ESRI File Geodatabase is ***unique*** for ArcMap software
- Recommended use of **Geopackages** (.gpkg) to store datasets
- Undertaken once a layer has been imported / created
- Ensure to also save the QGIS Workspace, (.qgz file)

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# QGIS – Importing of Layers

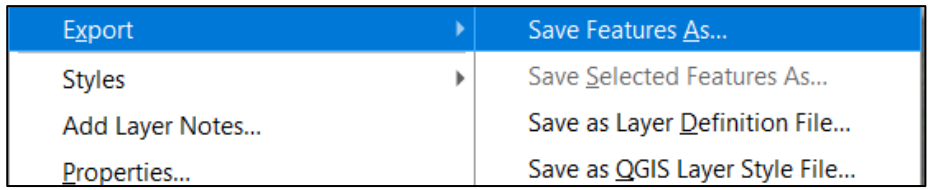
Where is this applicable:
- All Stage 4 Methodologies

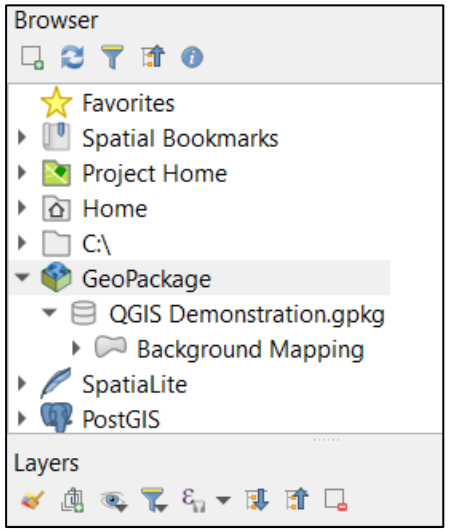
## Save Files to a Database:

- Right Click a File -> Export -> Save As
  - Ensure as a **GeoPackage**
  - Saving within the Database

- Files can also be **dragged from the Layers Panel** into the Database dropdown of the Browser Panel

- **Temporary layers** (Symbolised by ) are generated after some processes, are required to be saved, else will be lost after QGIS is closed.

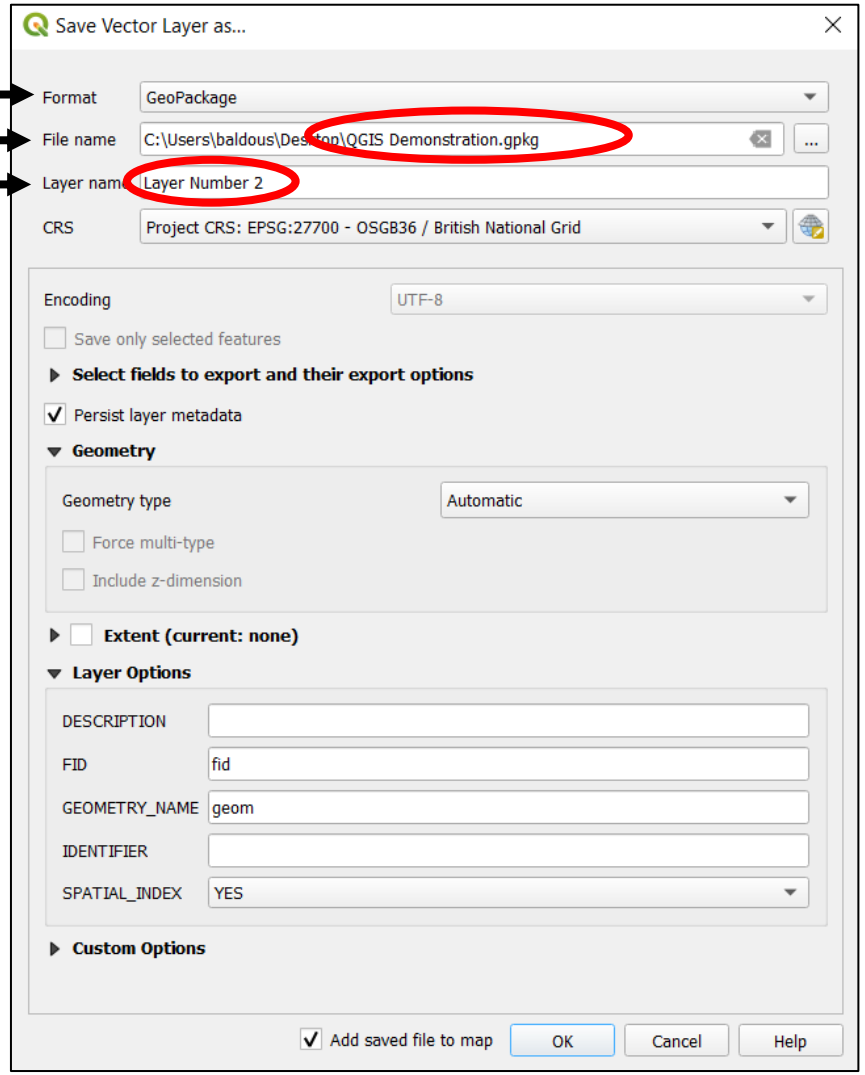



Save as ***GeoPackage***

Ensure **Database**

Layer name within Database

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# *QGIS Attribute Table Related*

- Copy Attribute Table to Excel
- Creation of Fields
- Field Calculator – Calculation (e.g. LHD)
- Set Max Values (e.g. 250m)
- Delete values from attribute table

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# QGIS – Attribute Table Related

**Attribute Table Related Introduction:**

- Visualizing displayed information on features of a selected vector layer.
- Creating new Fields and perform calculations on attributes.
- Deleting unused fields / columns.

# QGIS – *Attribute Table Related*

Where is this applicable:

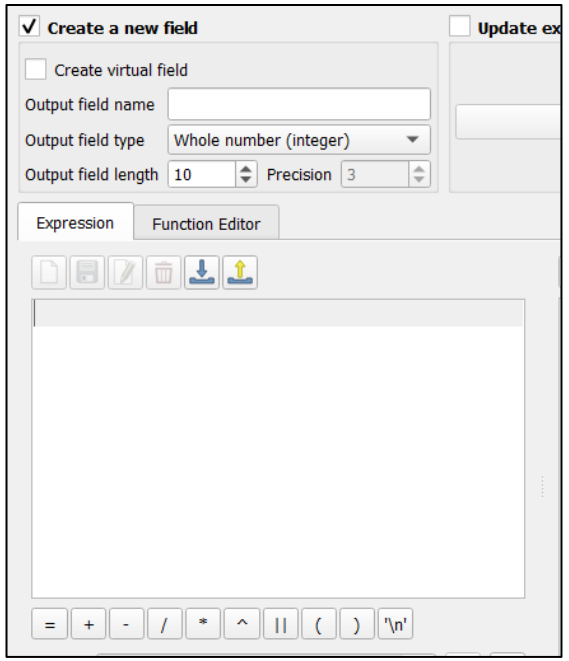
- Non-Domestic – (1, 2)
- Heat Networks – (1, 2)
- Off Gas Grid – (1)
- Energy Efficiency – (2)
- Mixed Tenure – N/A
- On Gas Grid – (1)

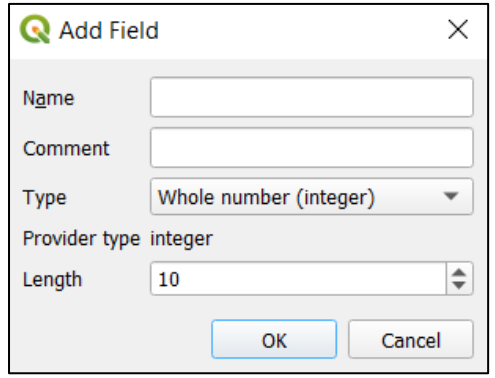
## Copy Attribute Table to Excel (1):

- Open Attribute Table ( )
  - Right Click Layer -> Open **Attribute Table**
- Select All (CTRL + A)
- **Copy** (CTRL + C)
- Open Excel
- **Paste** (CTRL + V)

## Creation of Fields (2):

- Open Attribute Table
- Enable Layer Editing ( )
- **Add Field** ( ) – this won't populate the field just create one
- OR
- From the **Field Calculator** ( ) – will simultaneously populate field if an expression or value is entered



# QGIS – *Attribute Table Related*

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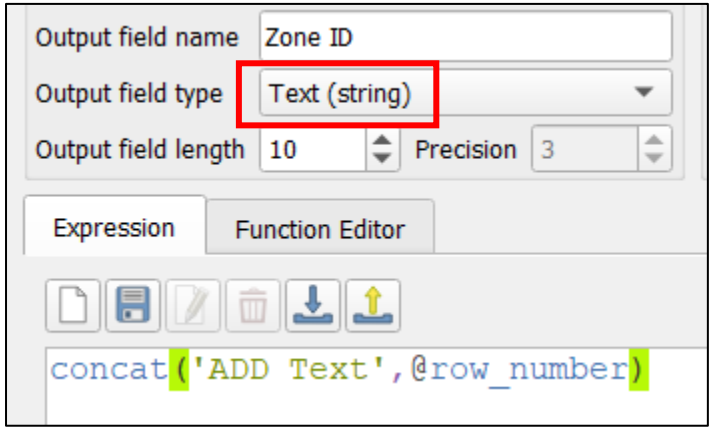
**Where is this applicable:**

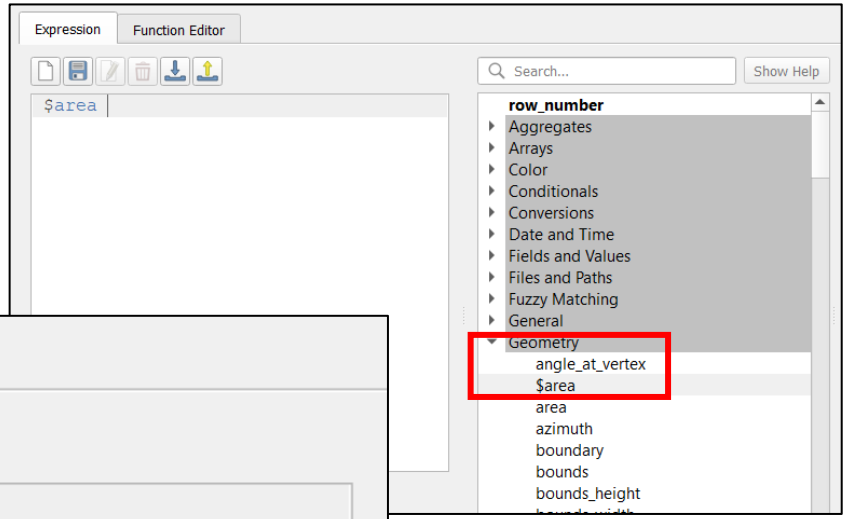
- Non-Domestic – (3)
- Heat Networks – (1, 2, 3)
- Off Gas Grid – N/A
- Energy Efficiency – (3)
- Mixed Tenure – N/A
- On Gas Grid – N/A

**Field Calculator Calculations:**

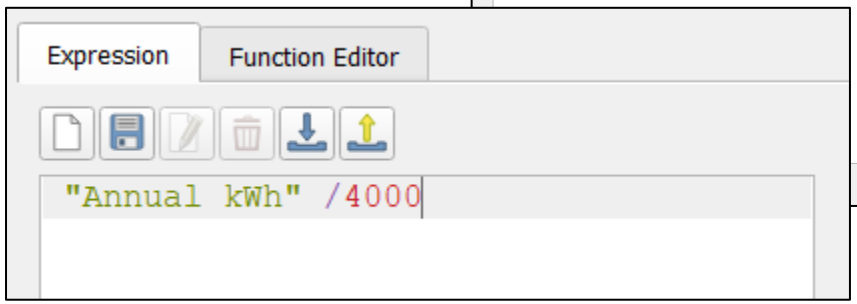
- Open Attribute Table
- Click **Field Calculator** (  )




1. Unique **Zone IDs**
   - Utilises '@row_number'
   - Ensure Field Type is as Text
   - Concat function combines text from multiple strings
   - Text within an expression is between single quotation marks ' '




2. Calculate **Area** ($m^2$)
   - '$area' from "Geometry" Dropdown




3. Field **Value Calculations** (e.g. LHD)
   - Select Fields from "Fields and Values" Dropdown
   - E.g. "Annual kWh"
   - Combine Fields with calculation
   - Fields within an expression once selected are between double quotation marks " "

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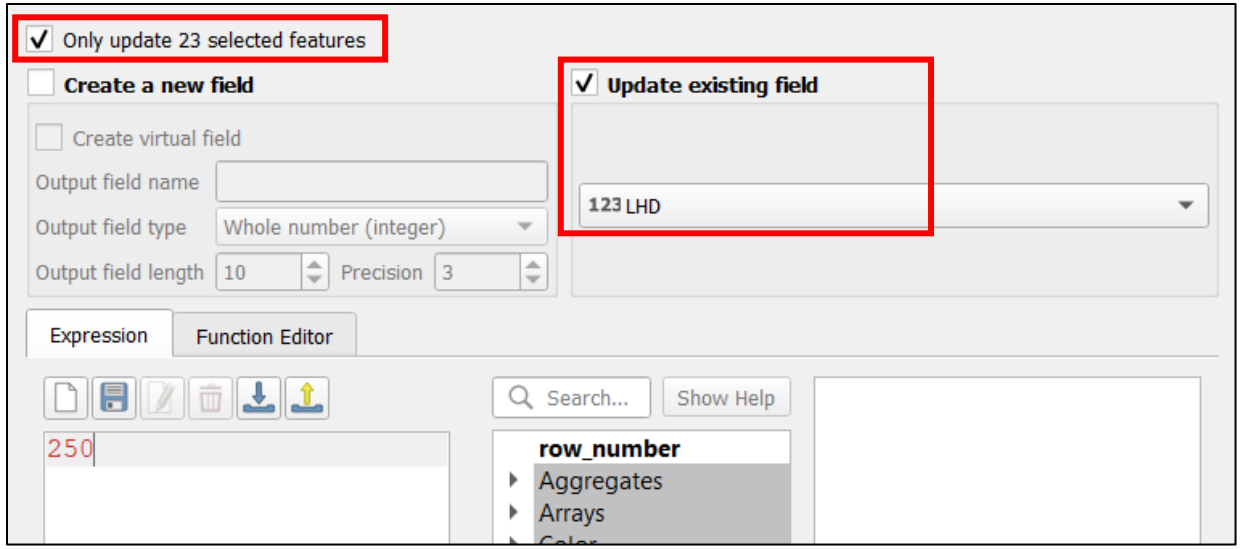
# QGIS – *Attribute Table Related*

Where is this applicable:

- Non-Domestic – N/A
- Heat Networks – (1, 2)
- Off Gas Grid – N/A
- Energy Efficiency – N/A
- Mixed Tenure – N/A
- On Gas Grid – N/A

**Field Calculator Calculations Continued:**

- Open Attribute Table
- Click **Field Calculator** ( )




1. Set **Max Values**
   - Select Values of which to overwrite (e.g. Select by Attributes)
   - Open Field Calculator
   - Ensure to click update selected features only
   - Click Update existing field and select the field from the dropdown
   - Enter in expression box value to overwrite with

2. **Delete rows** from Attribute Table
   - Select Rows / Values to delete
   - Enable Layer Editing ( )
   - Delete Selected Features ( )

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# *QGIS Selection Methods*

- Select by Attributes
- Visual Select Tool
- Clear Selection
- Creation, Deletion and Moving Points

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# QGIS – Selection Methods

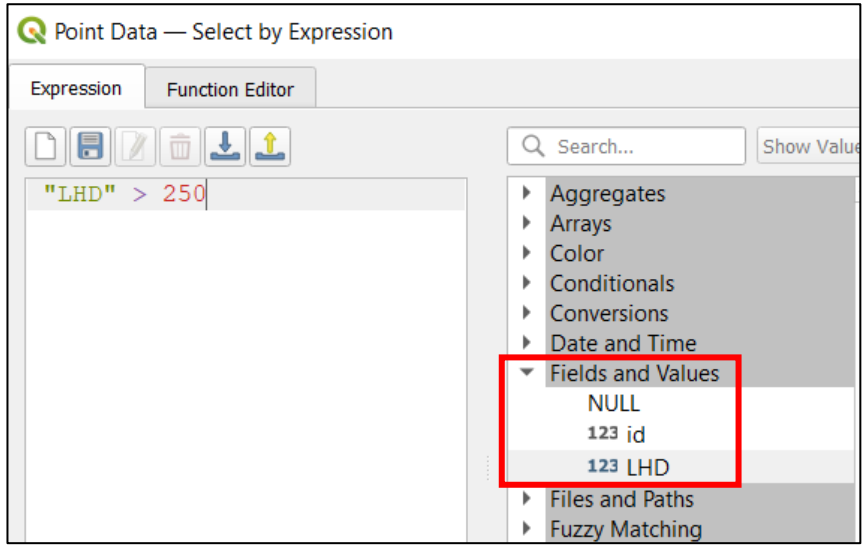
**Selection Methods Introduction:**

- Selecting by attributes (process in the attribute table)
- Selecting by location
- Adding and moving points – particularly useful after internal review

# QGIS – *Selection Methods*

Where is this applicable:
- All Stage 4 Methodologies

1. Select by **Attributes / Expression**
- Open Attribute Table of Layer
- Click Select Features Using An Expression ( )
- Insert Expression for Selection
  - Using the 'Fields and Values' dropdown to select the Field
- These can then be exported as new layer if required
  - Right Click Layer -> Export -> Save Selected Features As




2. **Clear Selection** Button
- Once a Selection has been made, ensure to clear the selection
- So doesn't affect future processes
- Click Deselect Features ( )

3. **Visual Selection**
- Click / Select layer in Layer Panel
- Click Select Features by Area ( )
  - Click and Drag to Select an Area
  - Single Click to Select a Point
  - Hold Shift or CTRL to Select more than one Point

# QGIS – *Selection Methods*

Where is this applicable:
- All Stage 4 Methodologies

1. Adding, Deleting and Moving **Point Data**

- Click / Select layer in Layer Panel
- Enable Layer Editing ( )
- **Add** a Point – Click Add Point Feature ( )
  - Click location, set values and OK
- **Delete** a Point – Select Point
  - Click Delete or Delete Selected Features ( )
- **Move** a Point – Click Vertex Tool ( )
  - Click on Point, Click for new Location
- Ensure to click Enable Layer Editing again to Save Changes

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# *QGIS Vector Processes*

- Buffer Tool
- Dissolve Tool
- Clip Tool
- Spatial Join Tool
- Polygon Attributes to Point Data
- Merging of Shapefiles

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# QGIS – Vector Processes

**Vector Processes Introduction:**

- Use various vector tools to perform spatial operations – this includes tools from different QGIS toolboxes
- How to carry out the analysis on appropriate vector layers – predominately point data but also polygon datasets

# QGIS – *Vector Processes*

**Where is this applicable:**

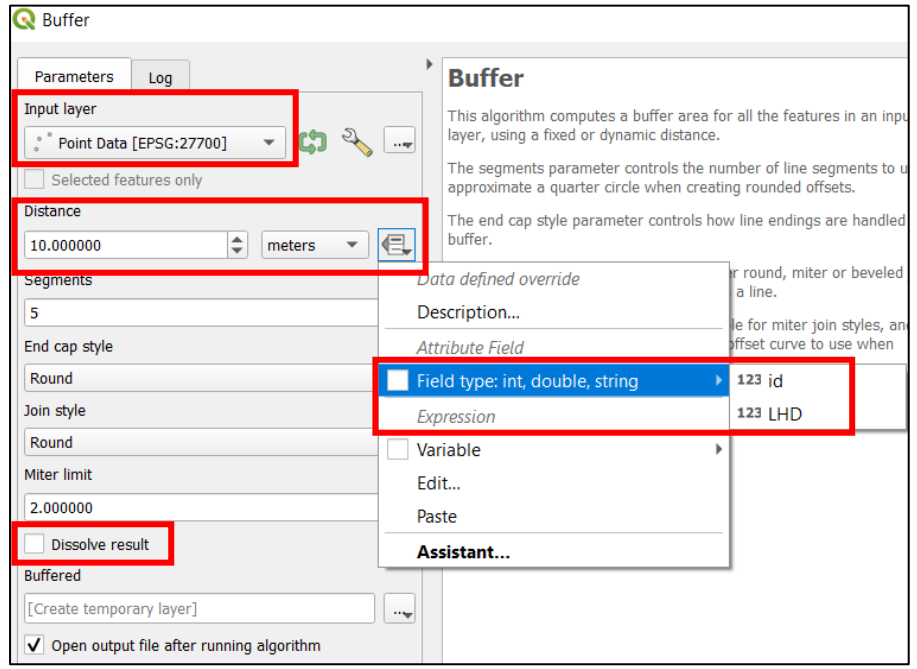
- Non-Domestic – N/A
- Heat Networks – (1, 2)
- Off Gas Grid – (2)
- Energy Efficiency – (2)
- Mixed Tenure – (2)
- On Gas Grid – (2)

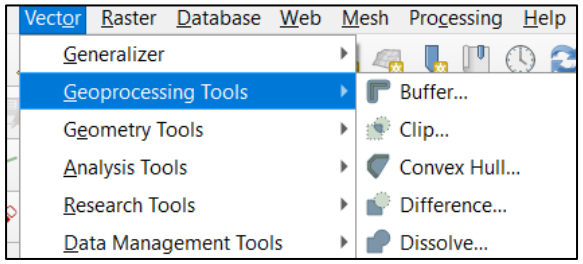
## 1. **Buffer** Tool

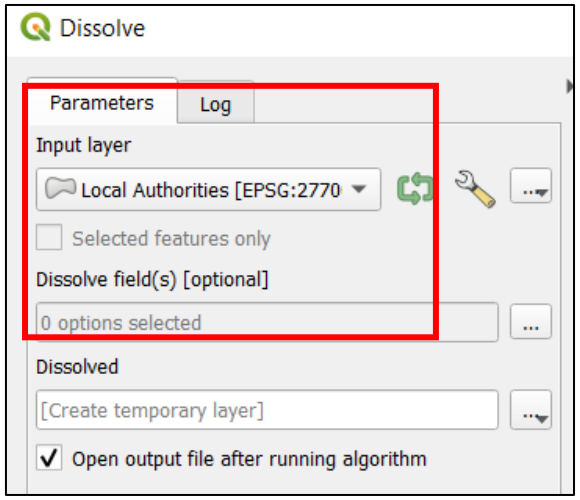
- Define areas at specified distances from an object
- Either a set distance e.g. 10 meters
- Or set by a Field Variable e.g. LHD Field
- May automatically Dissolve

## 2. **Dissolve** Tool

- Combining adjacent polygons, spatially or by a specified attribute
- Input Layer and Run if Spatially Dissolving
- Select “Dissolve Field” if Dissolving by Field Attribute



# QGIS – *Vector Processes*

**Where is this applicable:**

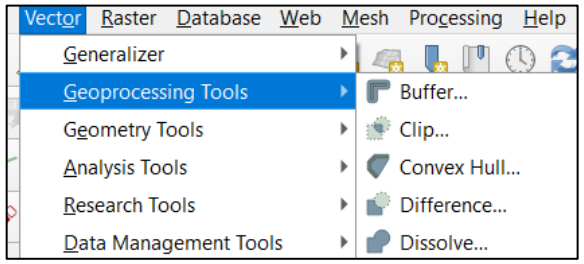
- Non-Domestic – N/A
- Heat Networks – (2)
- Off Gas Grid – (1)
- Energy Efficiency – N/A
- Mixed Tenure – (1)
- On Gas Grid – (1)

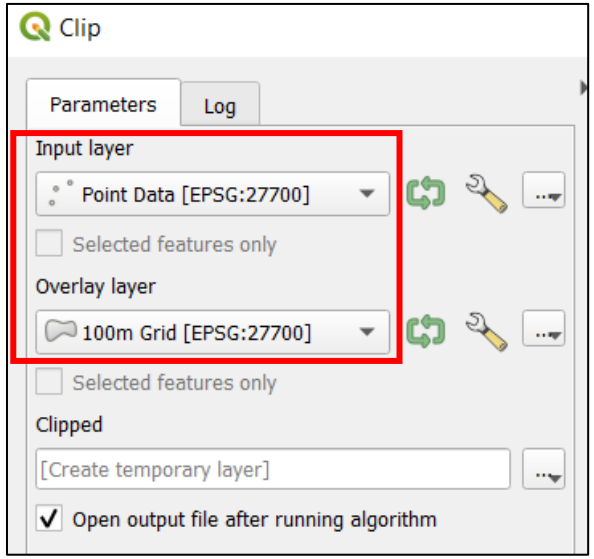
1. **Clip** Tool

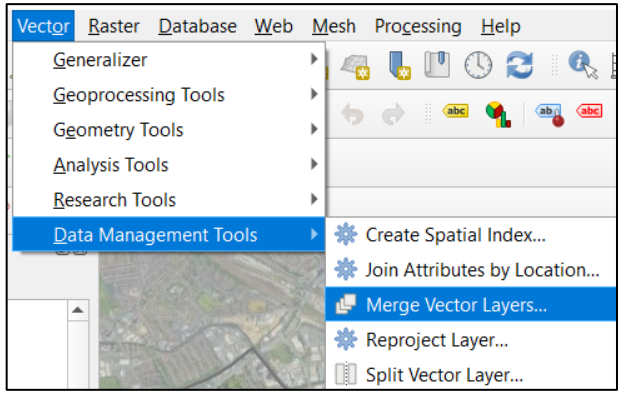
- Input Layer the user would like to clip e.g. Point Data
- Select Overlay which is the boundary to clip by, e.g. Certain IZ.

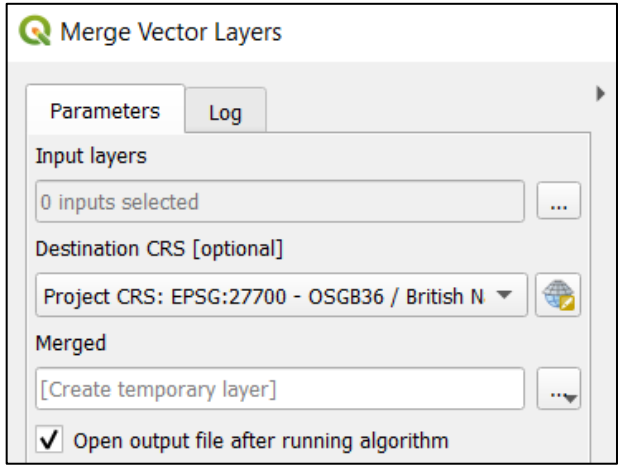
2. **Merge Shapefiles**

- Used when merging different LHD clusters together into one Shapefile
- Select **Merge Vector Layers**
- Select the layers to merge and the coordinate system



# QGIS – *Vector Processes*

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**Where is this applicable:**

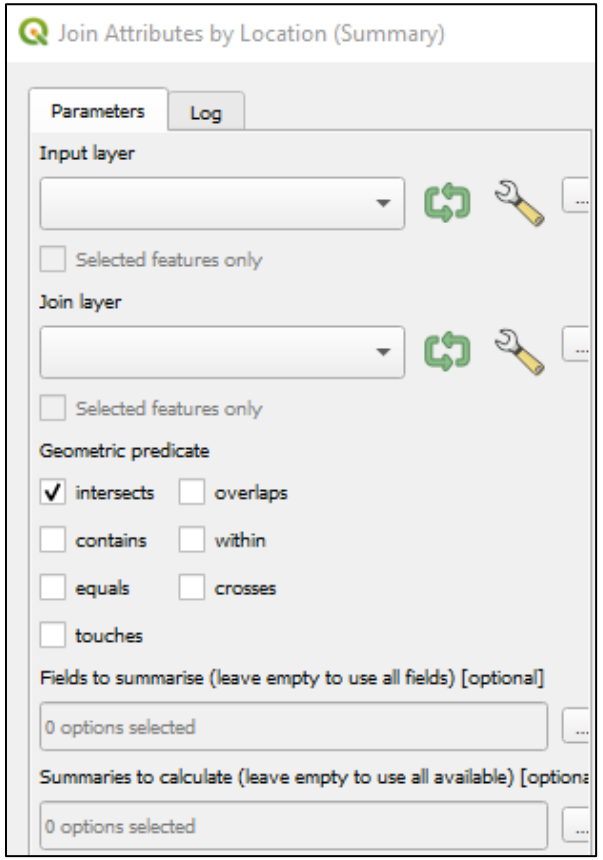
- Non-Domestic – (1, 2)
- Heat Networks – (1, 2)
- Off Gas Grid – (1)
- Energy Efficiency – N/A
- Mixed Tenure – N/A
- On Gas Grid – (1)

1. **Spatial Join** Tool

- To calculate Sum, Count and Averages
- Use "**Join Attributes by Location** (Summary)" Tool
  - Polygon is Input, Point data is Join Layer
  - Geometric predicate – leave as Intersect
  - Choose the field you want to summarise
  - Choose mean, and/or any other stats to calculate

2. **Polygon Attributes to Point Data**

- Use "**Join Attributes by Location** (Summary)" Tool
  - Point Data is Input, Polygon is Join Layer
  - Geometric predicate – leave as Intersect
  - Choose the field you want to Join

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# *QGIS Raster Processes*

- Raster to Polygon Tool
- Raster Calculator
- Raster Extract by Attributes
- Integer Tool
- Point to Raster Tool
- Inverse Distance Weighting Tool
- Raster Weighted Sum Tool
- Standard Deviation

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# QGIS – Raster Processes

**Raster Processes Introduction:**

- Converting to and from vector to raster
- Extracting raster values
- Carrying out analysis in the raster Field Calculator

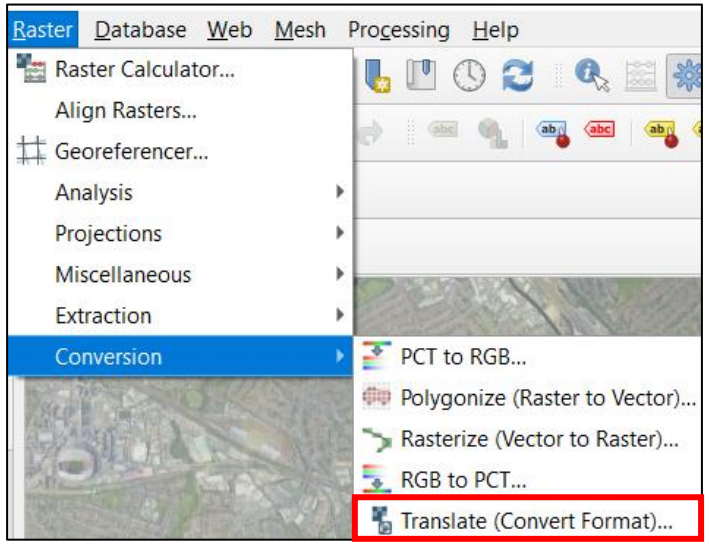
# QGIS – *Raster Processes*

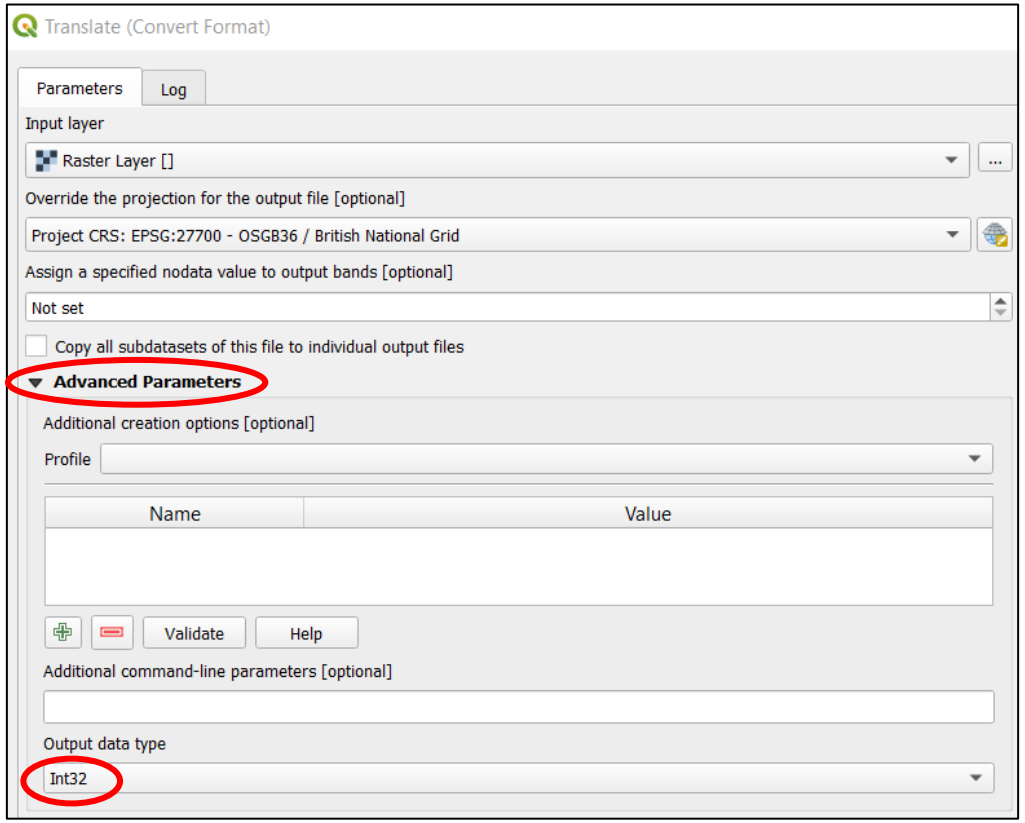
Where is this applicable:

- Non-Domestic – N/A
- Heat Networks – Yes
- Off Gas Grid – Yes
- Energy Efficiency – Yes
- Mixed Tenure – Yes
- On Gas Grid – Yes

**Integer Tool:**

- Rounding of Rasters to a **whole number integer**
- Raster -> Conversion -> Translate (Convert Format)
- Input Raster and select Coordinate System
- Click Advanced Parameters Dropdown
- Select "**Int32**"
- Int32 is chosen over Int16 due to holding larger numerical values



# QGIS – *Raster Processes*

Where is this applicable:

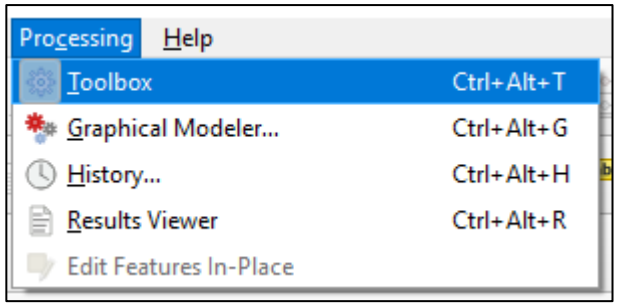
- Non-Domestic – N/A
- Heat Networks – (1, 2)
- Off Gas Grid – (2)
- Energy Efficiency – (1)
- Mixed Tenure – (2)
- On Gas Grid – (2)

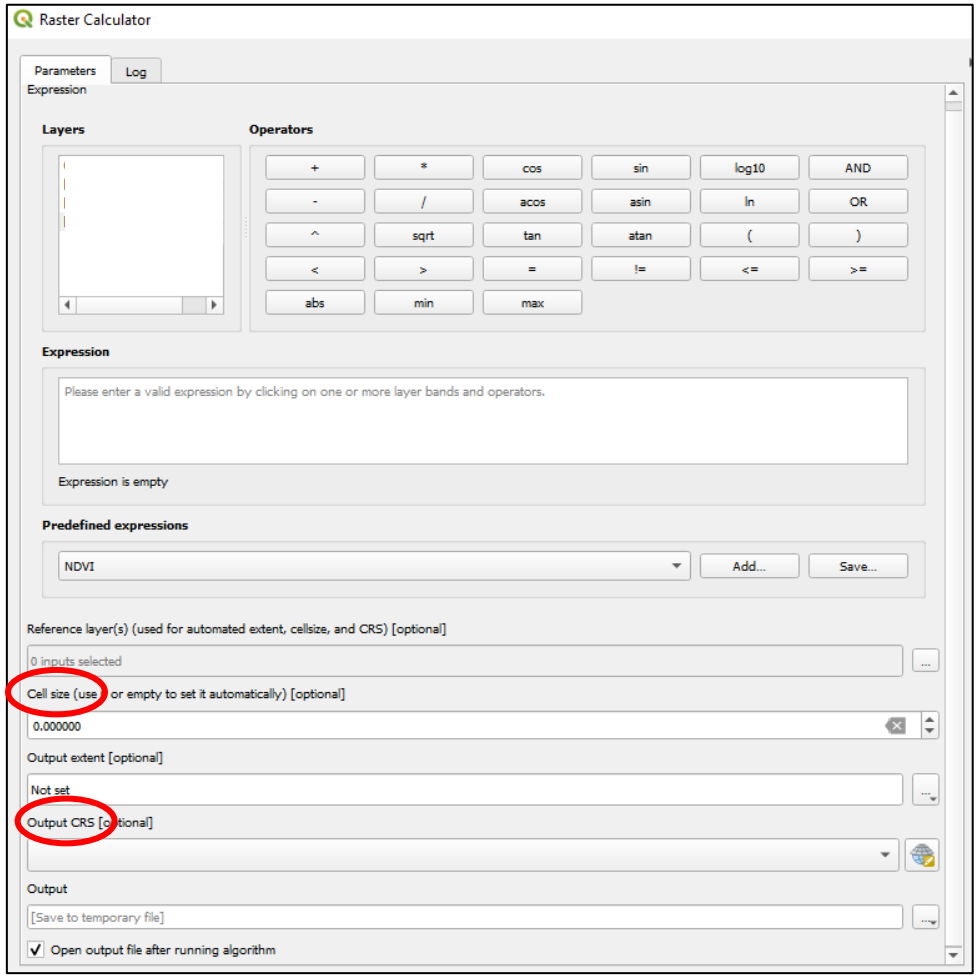
## 1. Raster Calculator

- Search for Tool within Processing Toolbox
- Very **similar tool** presentation between ArcMap and QGIS
- Ensure to change Cell Size and CRS

## 2. Raster Extract by Attributes

- No stand-alone tool
- Uses **Raster Calculator**
- In Expression box insert Layer and use = and/or < , > values to Select, e.g. areas over 50 kWh/yr/m2
- Creates areas with 1 or 0
- **Convert to Polygon**
- **Delete** areas = 0
- Alternatively for presentation purposes 0 values can be set to transparent for visual purposes



# QGIS – *Raster Processes*

Energy and Low Carbon Heat

**Where is this applicable:**

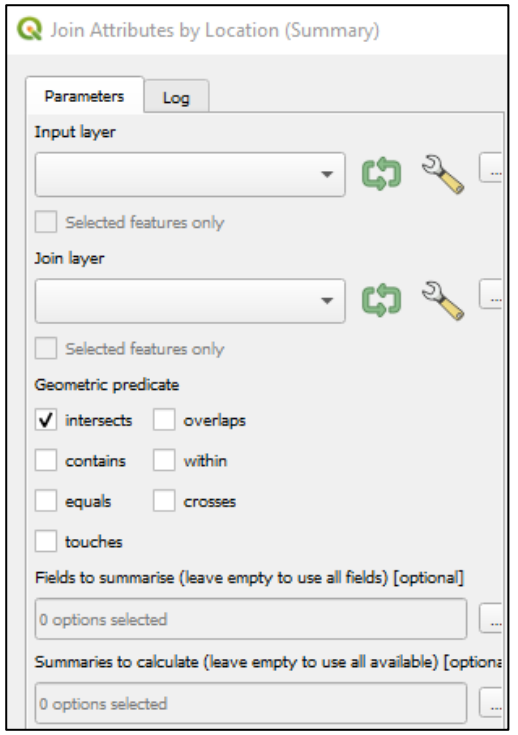
- Non-Domestic – N/A
- Heat Networks – (N/A)
- Off Gas Grid – (1, 2)
- Energy Efficiency – (1)
- Mixed Tenure – (1, 2)
- On Gas Grid – (1, 2)

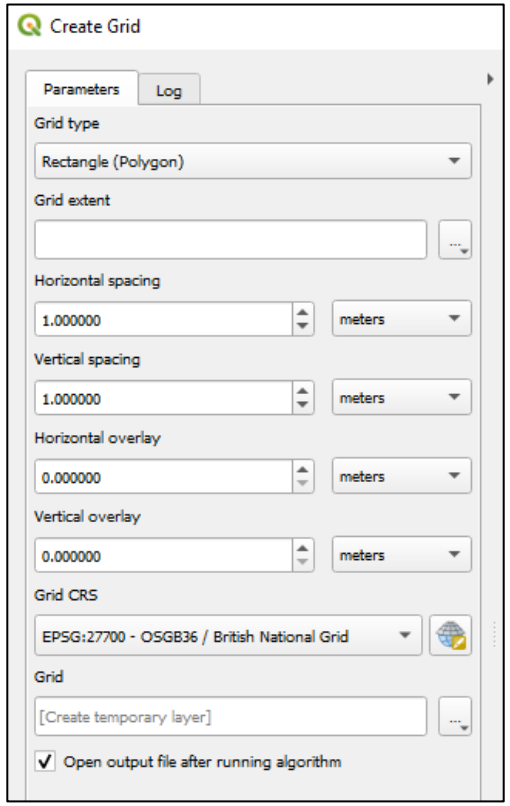
## 1. Raster to Polygon Tool

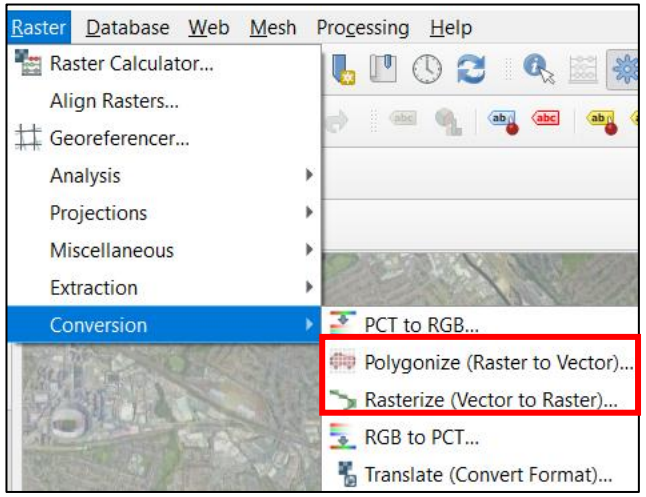
- Use **Polygonize** Tool
- Input Raster and Band (Field)

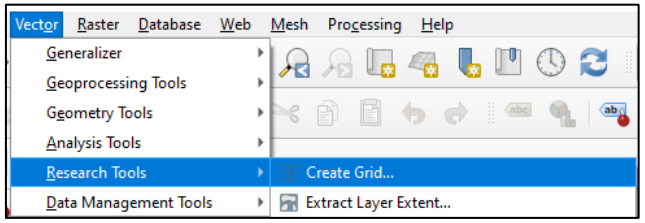
## 2. Point to Raster Tool

- No stand-alone tool to calculate Sum, Count and Average when converting to Raster
- **Create a Grid** – set as Rectangle, Grid extent to be that of the Point Dataset and create spacing e.g. 100m by 100m.
- Use "**Join Attributes by Location** (Summary)" Tool
  - Grid is Input, Point data is Join Layer
  - Geometric predicate – leave as Intersect
  - Choose the field you want to summarise
  - Choose mean, and/or any other stats to calculate
- Delete any squares with no data
- Use **Rasterize** Tool

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# QGIS – *Raster Processes*

Where is this applicable:

- Non-Domestic – N/A
- Heat Networks – N/A
- Off Gas Grid – (3)
- Energy Efficiency – (1, 2)
- Mixed Tenure – (3)
- On Gas Grid – (3)

1. **Inverse Distance Weighting (IDW)**

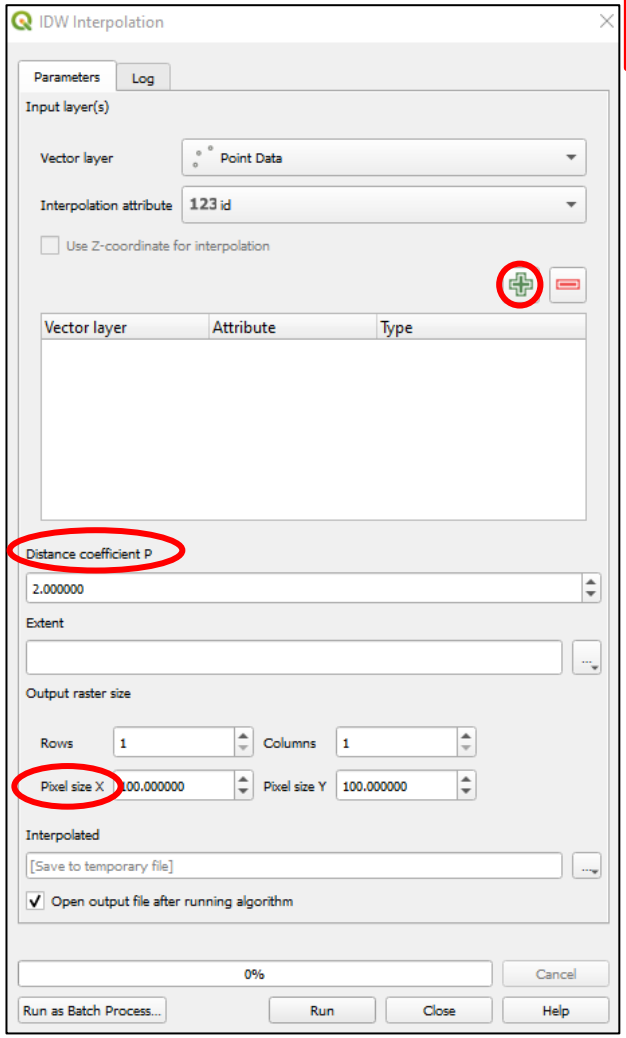
- Search for "**IDW** Interpolation" Tool within Processing Toolbox
- Select Layer and Field / Attribute, click **Add** (green plus)
- Set coefficient to **2.5**, pixel size to **100m** and extent

2. **Raster Weighted Sum Tool**

- Not stand-alone tool
- Uses **Raster Calculator**
- For Layer 1 (60% weighting), Layer 2 30%, Layer 3 10%:
- In Expression Box
  - 0.6*Layer 1 + 0.3*Layer 2 + 0.1*Layer 3
- Set Cellsize, extent and CRS and Click Run

3. Raster **Standard Deviation**

- Search for "**Raster Layer Statistics**" within Processing Toolbox
- Input Layer and Run
- Click Results Viewer to view Statistics such as Range, Mean, Standard Deviation of Raster Dataset.



ZERO WASTE SCOTLAND | Energy and Low Carbon Heat

# *QGIS Symbology Related*

- Different Types of Symbology
  - Graduated Colour
  - Colour by Category
- Symbology Classifications
- No. Classes and Range Values
- Sized Points
  - Colour and Size Combines
- Shape of Points
- Layer Transparency

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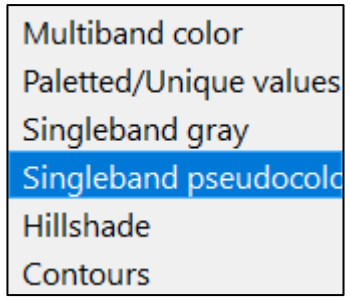
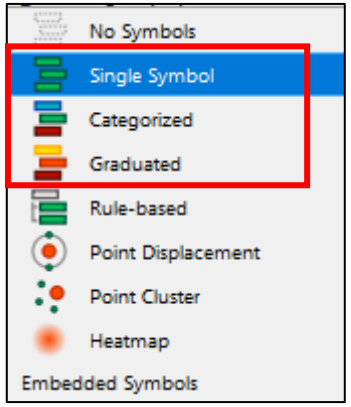
# QGIS – *Symbology Related*

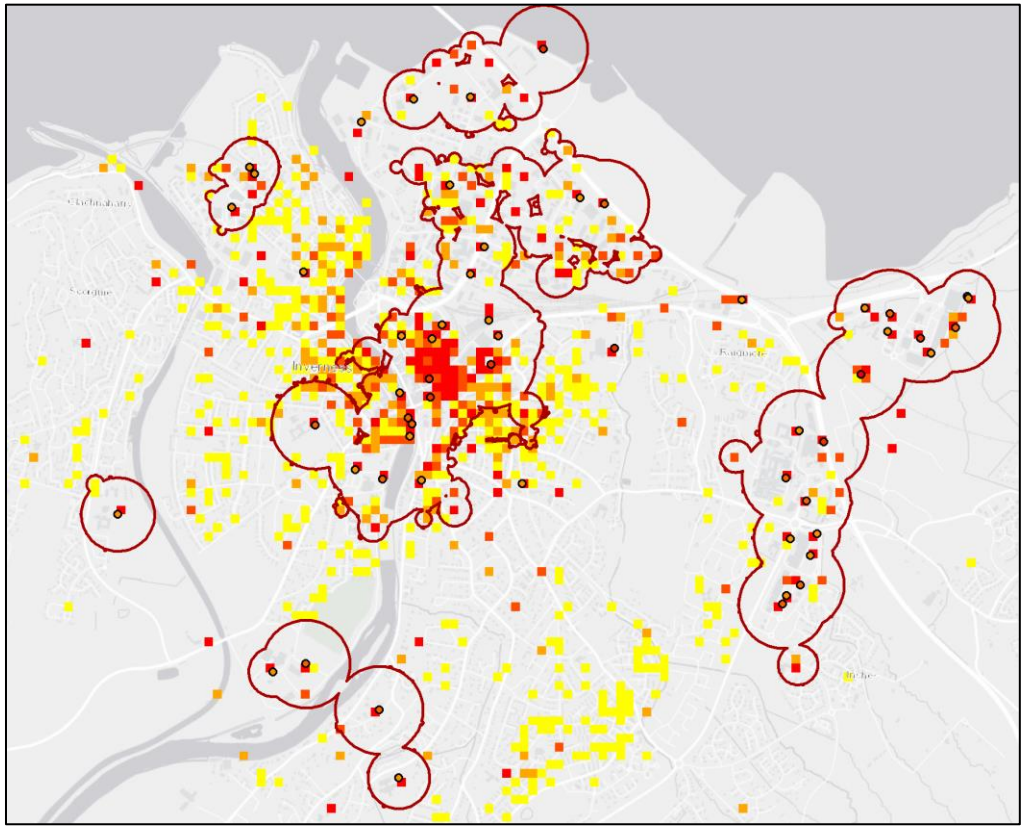
Where is this applicable:
- All Stage 4 Methodologies

To Open the Symbology Window of a Layer:
Right Click Layer -> Properties -> Symbology

**Four** primary Symbology types:
- Vector - Single Symbol
- Vector - Categorized
- Vector - Graduated
- Raster – Singleband Pseudocolor



# QGIS – *Symbology Related*

Where is this applicable:

- All Stage 4 Methodologies

**Single Symbol**:

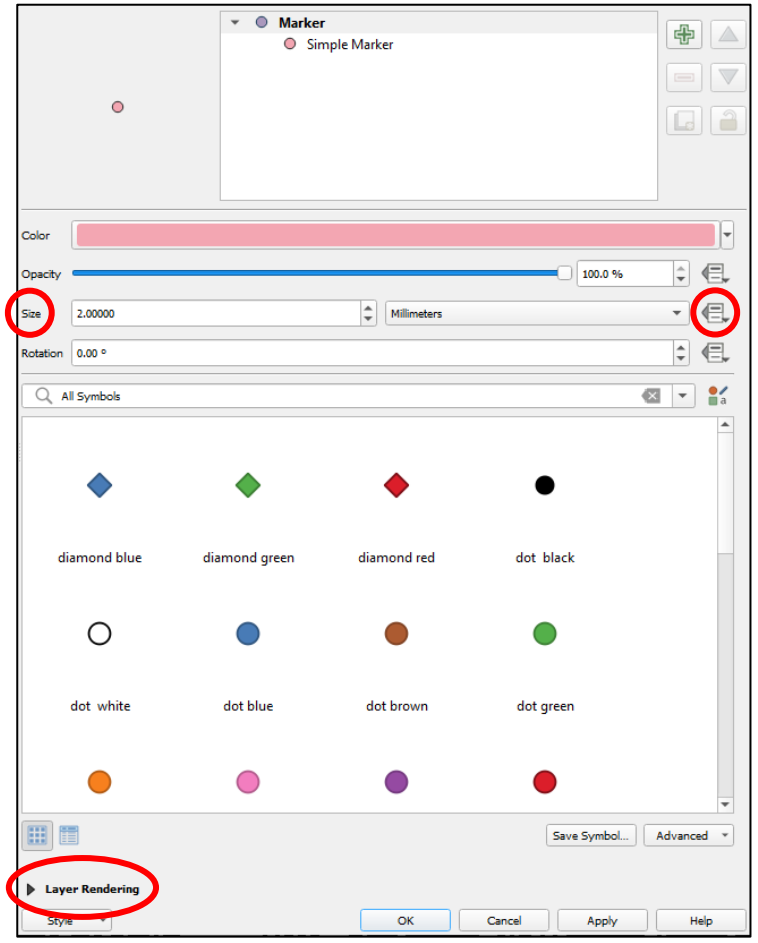
1. Point Data **Size**
- Point Size presented.

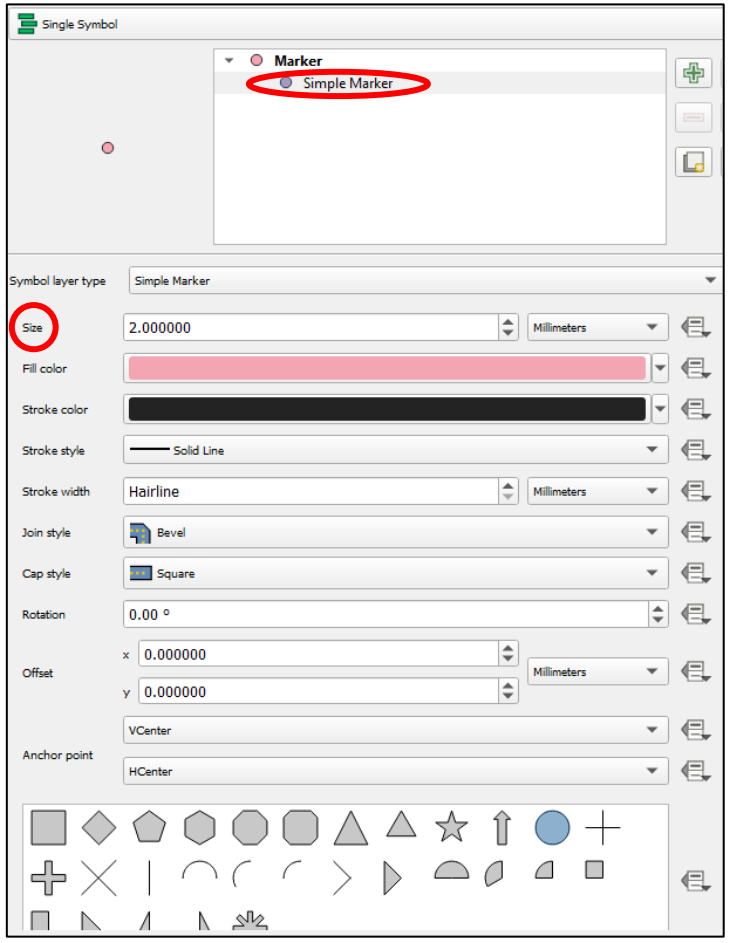
2. Point Data **Shape**
- Click “Simple Marker”, Select Shape at bottom

3. Point Data **Sized by Value**
- Click ( ) next to Size, Field Type and Select Field to size by e.g. Heat Demand.

4. Layer **Colour**
- Click “Simple Marker” and edit “Fill Color”, “Stroke Color”, “Stroke Style” and “Stroke Width”.

5. Layer **Transparency**
- Opacity bar presented
- Or click “Layer Rendering”



# QGIS – *Symbology Related*

Where is this applicable:
- All Stage 4 Methodologies

**Categorised**: - Unique Value Symbology
Select “Value” Field from dropdown list and click “Classify”

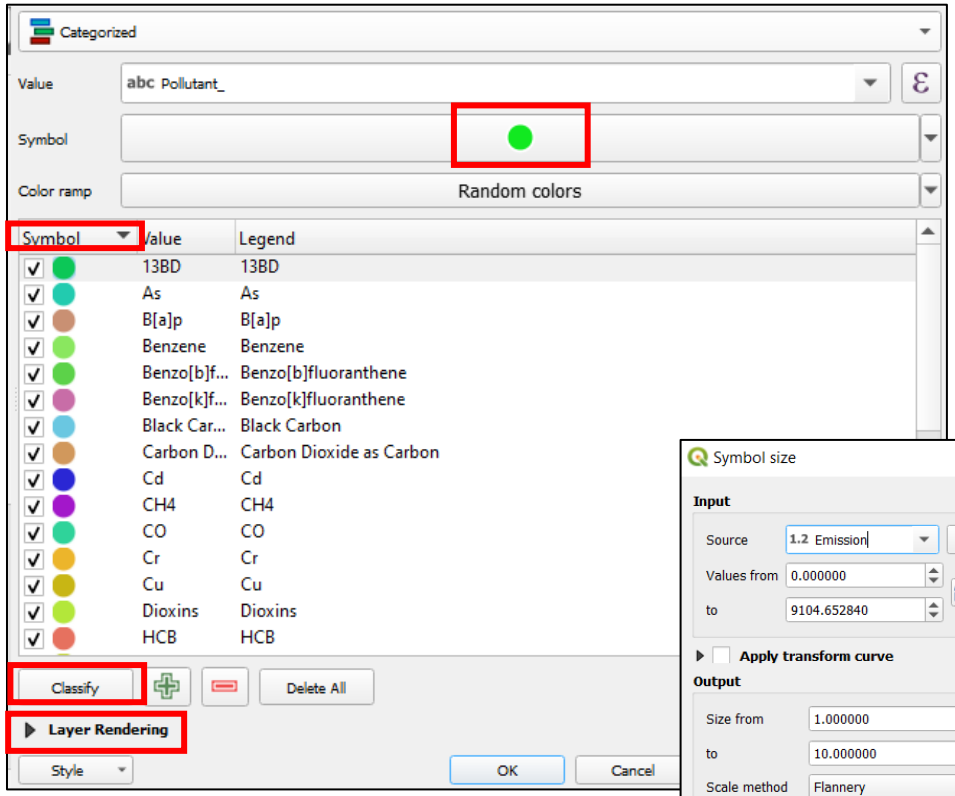
1. Point Data **Size**
- Click “Symbol” under “Value” to change ALL symbols.
- Click Symbols under Symbol Column to change manually

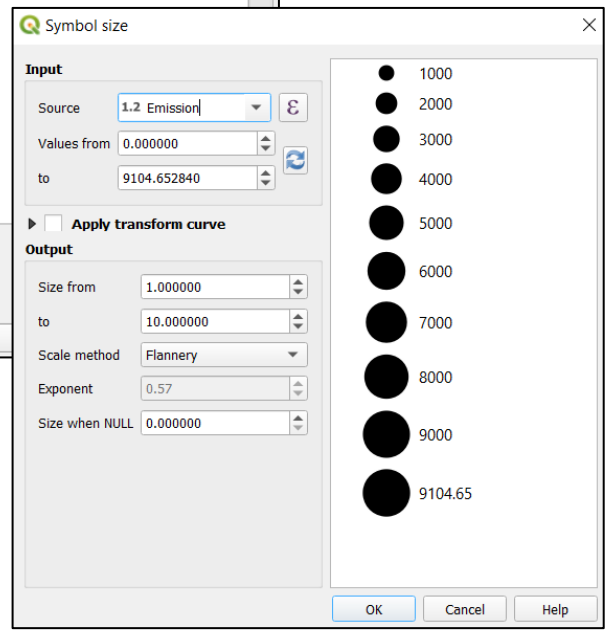
2. Point Data **Shape**
- Same as for Data Size

3. Colour by **Category and Size combined**
- Click “Symbol” under “Value”
- Click ( ) next to Size, -> Assistant
- Select Source / Field and Refresh ( )

4. Layer **Colour**
- Select Color Ramp from dropdown or “Random Colour”
- And/or Same as for Data Size

5. Layer **Transparency**
- Click “Layer Rendering”, change Opacity



# QGIS – *Symbology Related*

Where is this applicable:
- All Stage 4 Methodologies

**Graduated**: - Used to show **numerical quantitative differences**
Select “Value” Field from dropdown list and click “Classify”

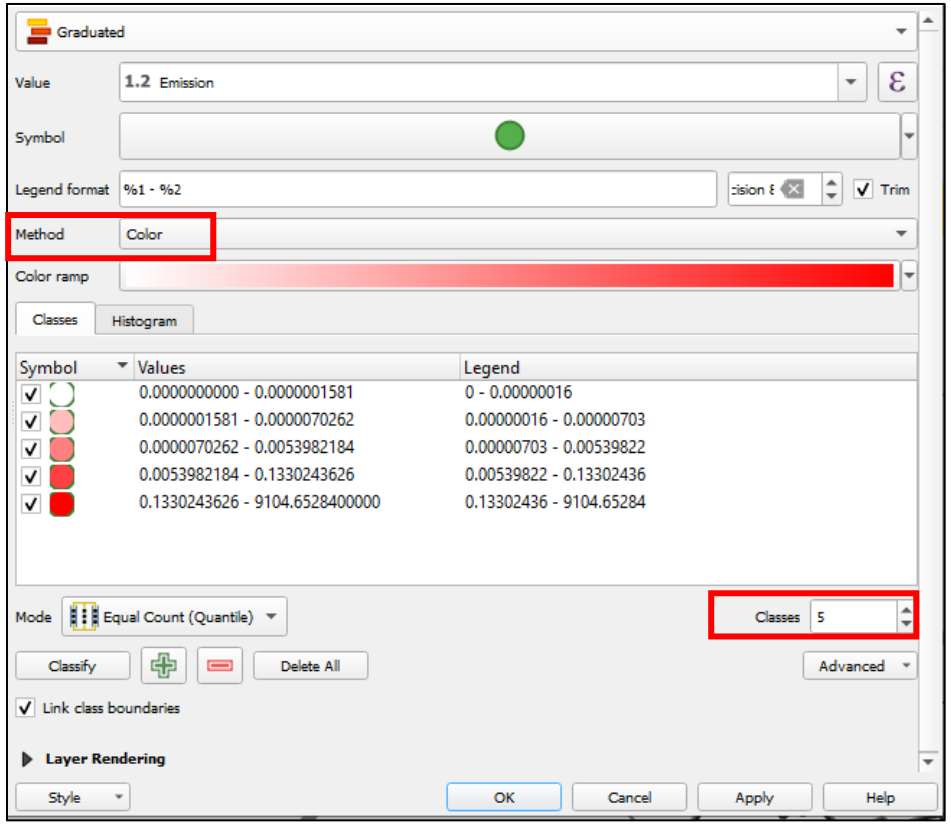
1. Point Data **Size and Shape**
- Click “Symbol” under “Value” to change ALL symbols.
- Click Symbols under Symbol Column to change manually
- Change Method present changes in **colour or size** of symbols

2. Layer **Colour**
- Select Color Ramp from dropdown
- Click Symbols under Symbol Column to change individually

3. Colour by **Category and Size combined**
- Same as for “Categorised”

4. Change no. **Classes** and **Range Values**
- Edit No. Classes
- Double Click Values in “Value Column” to edit band values.

5. Layer **Transparency**
- Click “Layer Rendering”, change Opacity



# QGIS – *Symbology Related*

Energy and Low Carbon Heat

**Where is this applicable:**

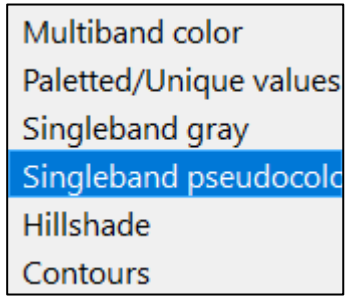
- Non-Domestic – N/A
- Heat Networks – (1, 2, 3)
- Off Gas Grid – (1, 2, 3)
- Energy Efficiency – (1, 2, 3)
- Mixed Tenure – (1, 2, 3)
- On Gas Grid – (1, 2, 3)

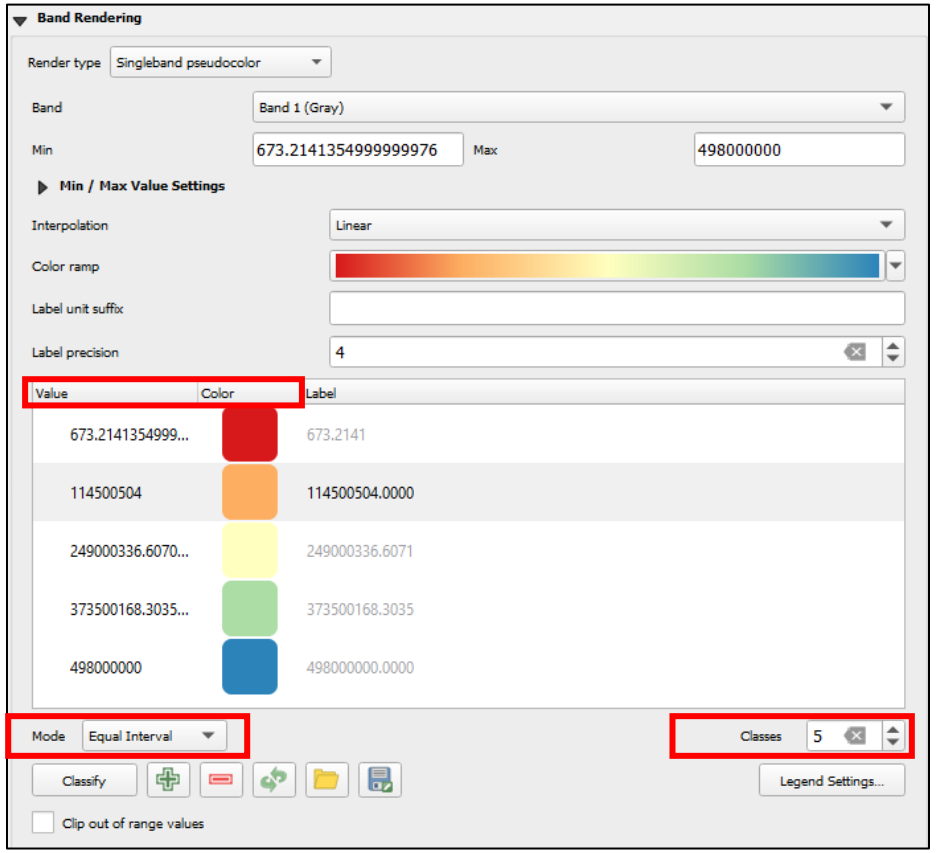
**Raster – Singleband Pseudocolor**:

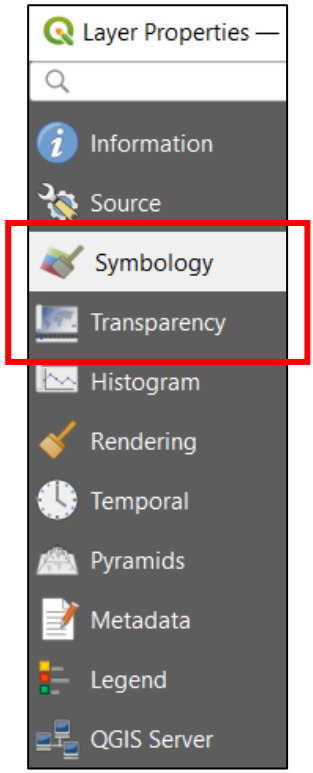
1. Layer **Colour**
- Select a “Color Ramp” from dropdown menu.
- Manually click Colour within “Color Column” to change.

2. Change no. **Classes** and **Range Values**
- Change Mode to “Equal Interval”
- May now edit No. Classes from default locked 5
- Double Click Values in “Value Column” to edit band values.

3. Layer **Transparency**
- Click “Transprency” in Layer Properties
- Edit “Global Opacity”

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# *ArcMap Task and QGIS counterpart*

- Table lists all ArcMap tasks referred to within LHEES Methodology
- Each is categorized and the equivalent QGIS function given.
- Task symbol in QGIS shown.
- Notes with short process overview provided.

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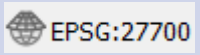
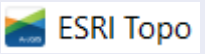
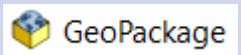
# GIS Task Database (1)

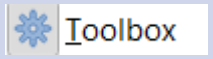
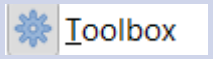
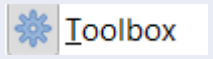
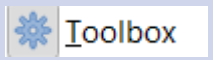
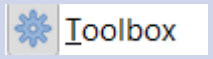
Each “ArcMap Task” is listed with the “Category” within this PowerPoint, the “QGIS Counterpart” name if different, a “Symbol” for the Task and brief notes on undertaking

| No. | ArcMap Task | Category | QGIS Counterpart | Task Symbol | Notes |
|---|---|---|---|---|---|
| 1 | Coordinate System | Set Up | *Same* |   | Project -> Properties -> CRS |
| 2 | Basemap | Set Up | *Same* |   | Web -> QuickMapServices -> ESRI -> ESRI Topo |
| 3 | Import Vector File | Importing Layers | *Same* |   | Layer -> Add Layer -> Add Vector Layer |
| 4 | Import Raster File | Importing Layers | *Same* |   | Layer -> Add Layer -> Add Raster Layer |
| 5 | Import CSV File | Importing Layers | *Same* |   | Layer -> Add Layer -> Add Delimited Text Layer<br>Click CSV -> Point Coordinates -> Set X and Y |
| 6 | ArcMap Geodatabase | Importing Layers | GeoPackage |   | Once layer in workspace. Save as Geopackage.<br>Set GeoPackage Database name and Layer Name |
| 7 | Save to Database | Importing Layers | GeoPackage |   | Drag into GeoPackage OR<br>Save as Geopackage, same Database, set Layer Name |
| 8 | Copy to Excel | Attribute Table | CSV File |   | Export -> Save As -> Comma Separated Value (CSV) |
| 9 | Editing | Attribute Table | Editing Mode |  | In QGIS Digitizing Toolbar OR<br>Within Attribute Table (AT) -> Enable Editing |
| 10 | Add Field | Attribute Table | New Field |  | Open AT -> Enable Editing -> New Field |

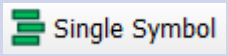
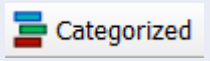
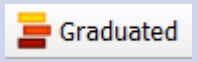
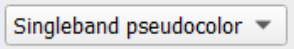
# GIS Task Database (2)

| No. | ArcMap Task | Category | QGIS Counterpart | Task Symbol | Notes |
|---|---|---|---|---|---|
| 11 | Field Calculator | Attribute Table | *Same* |  | Open AT -> Field Calculator |
| 12 | Delete Selected | Attribute Table | *Same* |  | Open AT -> Enable Editing -> New Field |
| 13 | Select by Attributes | Selection Method | Select by Expression |  | Open AT -> Click -> Create Expression |
| 14 | Clear Selection | Selection Method | Deselect Features |  | In QGIS Selection Toolbar OR Within AT |
| 15 | Select Features | Selection Method | *Same* |  | In QGIS Selection Toolbar |
| 16 | Create Features | Selection Method | Add Point Feature |  | Enable Editing -> In QGIS Digitizing Toolbar |
| 17 | Edit Vertices | Selection Method | Vertex Tool |  | Enable Editing -> In QGIS Digitizing Toolbar |
| 18 | Delete Feature | Selection Method | Delete Selected |  | Enable Editing -> Select Feature -> Click or DELETE |
| 19 | Buffer | Vector Processes | *Same* |  | Vector -> Geoprocessing -> Buffer |
| 20 | Dissolve | Vector Processes | *Same* |  | Vector -> Geoprocessing -> Dissolve |
| 21 | Clip | Vector Processes | *Same* |  | Vector -> Geoprocessing -> Clip |
| 22 | Merge | Vector Processes | Merge Vector Layers |  | Vector -> Data Management -> Merge Vector Layers |

# GIS Task Database (3)

| No. | ArcMap Task | Category | QGIS Counterpart | Task Symbol | Notes |
|---|---|---|---|---|---|
| 23 | Spatial Join | Vector Processes | Join Attributes by Location (Summary) |   | Search for tool within Processing Toolbox (Processing -> Toolbox) |
| 24 | Int (Spatial Analyst) | Raster Processes | Translate (Convert Format) |   | Raster -> Conversion -> Translate (Convert Format) |
| 25 | Raster Calculator | Raster Processes | *Same* |   | Search for tool within Processing Toolbox |
| 26 | Extract by Attributes | Raster Processes | Raster Calculator |   | Search for tool within Processing Toolbox (Processing -> Toolbox) -> Convert to Polygon & Delete unsuitable values or alter Symbology |
| 27 | Raster to Polygon | Raster Processes | Polygonize |   | Raster -> Conversion -> Polygonize |
| 28 | Point to Raster | Raster Processes | Rasterize |   | Raster -> Conversion -> Rasterize<br>To Get Statistics also -> Create Grid -> Join Attributes by Location -> Rasterize |
| 29 | Inverse Distance Weighting (IDW) | Raster Processes | IDW Interpolation |   | Search for tool within Processing Toolbox |
| 30 | Weighted Sum | Raster Processes | Raster Calculator |   | Search for tool within Processing Toolbox |
| 31 | Standard Deviation | Raster Processes | Raster Layer Statistics |   | Search for tool within Processing Toolbox (Processing -> Toolbox) |

# GIS Task Database (4)

| No. | ArcMap Task | Category | QGIS Counterpart | Task Symbol | Notes |
|---|---|---|---|---|---|
| 32 | Single Symbol | Symbology | *Same* |   | Right Click -> Symbology -> Single Symbol<br>Set Size<br>Size by Value -> Click 'Data Defined Overide' -><br>Field Type -> Select Field<br>Simple Marker -> Set Shape, Fill and Stroke Colours<br>Layer Rendering -> Transparency |
| 33 | Categories | Symbology | Categorized |   | Right Click -> Symbology -> Categorized<br>Click Main Symbol -> Set Size and Shape<br>Click Individual Symbols -> Set Colours<br>Size by Value -> Click Main Symbol -> 'Data Defined Overide' -> Assistant -> Select Field<br>Layer Rendering -> Transparency |
| 34 | Quantities | Symbology | Graduated |   | Right Click -> Symbology -> Graduated<br>Click Main Symbol -> Set Size and Shape<br>Set Colour ramp<br>Set no. Classes and Range Values<br>Layer Rendering -> Transparency |
| 35 | Raster Classified | Symbology | *Singleband Pseudocolor* |   | Right Click -> Symbology -> Singleband Pseudocolor<br>Set Colour ramp<br>Set no. Classes and Range Values<br>Layer Properties -> Transparency |